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AUG 07 2007

CLAIMS

I claim:

Claims 1 - 36(canceled)

1 37.(withdrawn) A circular extrusion die comprising
2 distribution section for forming at least a first molten polymer material into a generally even
3 circular flow, and
4 bodily separate from said distribution section an exit section comprising
5 an annular main channel with generally cylindrical or conical walls for receiving said generally
6 circular flow of said first polymer material and conducting the same to an annular exit orifice to exit
7 there from as a tubular film structure,
8 said exit section also comprising a channel system spaced radially from said main channel
9 for extrusion from the circumference of said exit section of a circular array of narrow strands of a
10 second molten polymer material,
11 said channel system ending in a circular row of internal orifices opening into a circular wall
12 portion of the main channel upstream of said exit orifice so that said circular array of said second
13 polymer material merges with the circular flow of said first polymer material as circumferentially
14 spaced strands superimposed on said circular flow.

1 38.(withdrawn) A circular extrusion die according to claim 37 wherein said channel system
2 for said circumferential extrusion begins at at least one inlet in said exit section and comprises
3 for delivering said second polymer material to each said internal orifice a labyrinthine sub-
4 channel system communicating at one end with such inlet and at the other end with the respective
5 internal orifice,
6 said sub-channel system comprising at least three channel-branchings between said ends to
7 promote a balanced division of polymer flow to said internal orifices.

Claims 39 - 73(canceled)

1 74.(withdrawn) A circular extrusion die according to claim 38 which further comprises a small
2 circumferential channel in said wall portion of said circular main channel upstream of the exit
3 thereof, said internal orifices opening in common into said small channel.

1 75.(withdrawn) An extrusion die according to claim 37 which further comprises an additional
2 circular channel for extruding a circular flow of a third molten polymer material on the side of said
3 generally circular flow of said first polymer material facing said circular array of narrow strands of
4 said second material upstream of the point where the circular array merges with first circular flow
5 to thereby form on the first circular flow of said first polymer material a continuous layer of said
6 third polymer material underlying said circular array of narrow strands upon its merger with the first
7 circular flow.

1 76.(canceled)

1 77.(currently amended) The A cross-laminate according to claim 76118 wherein:
2 the pattern of the discontinuous layer of the film A comprises at least one first array of
3 substantially parallel strands,
4 the pattern of the discontinuous layer of the film B comprises at least one second array of
5 substantially parallel strand, and
6 the strong bonds comprise crossing points of the two arrays formed by direct lamination the
7 strands in the respective arrays are in contact with one another at their crossing points and are of a
8 polymer material such as to be directly laminated to each other at said crossing points.

1 78.(currently amended) The A cross-laminate according to claim 76119, wherein:
2 The polymer material of the strands of at least one of said arrays discontinuous layer of at
3 least one of the films A and B comprises coloration material in an sufficient amount, a coloration,
4 or an amount and coloration sufficient to render the strands at least one colored discontinuous layer
5 visible through at least one side of the cross-laminate.

1 79.(currently amended) The A cross-laminate according to claim 76118, wherein:
2 the a thickness of the discontinuous layers strands in the first surface layer of each of said the
3 films A and B is are not greater than 20% of the a thickness of their respective films.

1 80.(currently amended) The A cross-laminate according to claim 76118, wherein:

1 the a collective area of the discontinuous layers of the films A and B comprises strands in
2 ~~each of said first surface layers constitutes not no~~ more than 60% of the a surface area of the their
3 respective film sides.

1 81.(currently amended) The A cross-laminate according to claim 76118, wherein the a
2 thickness increase in each of said the films A and B at the locations where the strands discontinuous
3 layers are present is at most 20% of the a film thickness in adjacent strand-free regions thereof where
4 the discontinuous layer are absent.

1 82.(currently amended) The A A cross-laminate according to claim 7677, wherein the a
2 distance from the a center-to-center of adjacent pairs of strands in each array is between 2 mm and
3 40 mm.

1 83.(currently amended) The A cross-laminate according to claim 76119, wherein:
2 the lamination a strength at said crossing points of the thin strands of said arrays is of the
3 strong bonds are at least 40 g cm⁻¹, as measured by a peel test carried out on narrow specimens of
4 the cross-laminate at a velocity of about 1 mm sec⁻¹, and
5 and the lamination a strength in the strand-free regions is of the weak bonds are less than or
6 equal to at the highest 75% of the bonding strength of the strong bonds between the strands at said
7 the crossing points, as measured by said the peel test.

1 84.(canceled)

1 85.(currently amended) The A cross-laminate according to claim 7684, which comprises
2 wherein:
3 on at least one of its outer films, a coextruded an exterior layer formed on an exterior surface
4 of at least the film B or the second B film layer of comprising a polymer material adapted to enhance
5 a surface property of the laminate, where the property is selected from the group consisting of its
6 heat-sealing capability or and its frictional properties property.

1 86.(currently amended) The A cross-laminate according to claim 76118, wherein:

1 the main layer of each of said the two films A and B consists essentially of polyethylene or
2 polypropylene.

1 87.(currently amended) The A cross-laminate according to claim 76119, wherein:

2 ~~in each of said films A and B:~~

3 the main layers ~~is~~ are selected from the group consisting of HDPE, LLDPE or a blend of the
4 two,

5 the ~~continuous second surface bonding layers~~ is formed mainly of comprise LLDPE in
6 admixture with 5 - 25% of a copolymer of ethylene having a melting point or a melting range within
7 the temperature range of 50 - 80°C, and

8 the ~~strands in the first surface layers of said the films~~ is discontinuous layers comprise
9 ~~selected from a polymer which consists~~ consisting essentially of a copolymer of ethylene having a
10 melting point or a melting range within the temperature range of 50 - 100°C or a blend of such
11 copolymer and LLDPE containing at least 25% of the said the copolymer.

1 88.(currently amended) The A cross-laminate according to claim 7787, wherein:

2 said the bonding second surface layers includes an adhesion modifying material to establish
3 a blocking between the contacting mutually facing strand-free regions thereof to aid in adhesion of
4 the weak bonds.

1 89.(currently amended) The A cross-laminate according to claim 7677, wherein:

2 the pattern of the discontinuous layer the first surface layer on at least one of said the films
3 A and B comprises at least two of said arrays of strands,

4 at least one of said the two arrays of strands being formed of a polymer material differing in
5 appearance from the another of said the two arrays of strands and

6 where the strands of the differing two arrays being are interspersed ~~with one another~~.

1 90.(currently amended) The A cross-laminate according to claim 76118, wherein:

2 ~~said first surface layer on the discontinuous layers of~~ each of the films A and B constitutes
3 at their highest 10% of ~~the volume~~ a height of their corresponding film.

1 91.(currently amended) The A cross-laminate according to claim 76118, wherein:
2 the an average melting point of the polymer material which constitutes of the strand-formed
3 first layer discontinuous layer of each of said the films A and B is at least about 10°C lower than the
4 an average melting point of the polymer material of the the main layer of each of the films A and B.

1 92.(currently amended) The A cross-laminate according to claim 76118, wherein:
2 the an average melting point of the polymer material which constitutes of the strand-formed
3 first layer discontinuous layer of each of said the films A and B is at least about 15°C lower than the
4 an average melting point of the polymer material of the the main layer of each of the films A and B.

1 93.(currently amended) The A cross-laminate according to claim 76118, which further
2 comprises comprising:
3 a continuous extrusion lamination bonding layer introduced between said films A and B to
4 laminate said films in said sandwich relation interposed between the main layer and the
5 discontinuous layer of at least one of the films A and B.

1 94.(currently amended) The A cross-laminate according to claim 76118, wherein:
2 the a thickness of the strands in said first surface layer discontinuous layers of each of said
3 the films A and B is are not greater than 10% of the a thickness of their respective film.

1 95.(currently amended) The A cross-laminate according to claim 76118, wherein
2 the a thickness increase of each of said the films A and B at the locations where the strands
3 are discontinuous layer is present is at most 10% of the a film thickness in strand-free regions of the
4 films free of the discontinuous layer.

1 96.(currently amended) The A cross-laminate according to claim 76119, wherein:
2 the lamination a strength of the weak bonds is no in said strand-free regions of said cross-
3 laminate is not more than 50% of the lamination a strength of the strong bonds at said crossing points
4 of the strands thereof, as measured by a peel test carried out on narrow specimens of the cross-
5 laminate at a velocity of about 1 mm sec⁻¹.

1 97.(currently amended) The A cross-laminate according to claim 7678, wherein the cross-
2 laminate has having a thickness at ~~the highest~~ its thickest of about 0.3 mm, and:

3 wherein ~~a said film A is situated at one of its sides,~~

4 said film A having its an exterior surface of the film A is corrugated to form a visible pattern
5 of striations extending in one direction,

6 ~~with the where~~ a spacing of said the striations in ~~said pattern~~ being at most about 3 mm,

7 the main layer and ~~said second surface~~ the bonding layer of said the film A are substantially
8 transparent to enable the coloured colored strands to be visible when the laminate is observed from
9 an A-side one of the exterior surfaces of the cross-laminate, and

10 the a depth of the corrugations is sufficient to impart a three-dimensional effect to ~~said the~~
11 cross-laminate such that the strands appear to be spaced internally from the exterior surface of said
12 the film A a distance substantially greater than ~~the an~~ actual maximum thickness of ~~said the~~ film A.

1 98.(currently amended) The A cross-laminate according to claim 76118, wherein:

2 said first surface layer on the discontinuous layers of each of the films A and B constitutes
3 at their highest 5% of the volume a height of their corresponding film

1 99.(currently amended) The A cross-laminate according to claim 76118, wherein:

2 the average melting point of the polymer material which constitutes the strand-formed first
3 surface layer of each of said the films A and B is at least about 20°C lower than the average melting
4 point of the polymer material which constitutes the main layer thereof.

1 100.(currently amended) The A cross-laminate according to claim 76118, wherein the distance
2 from center-to-center of adjacent strands of each said the first surface layer is not greater than 20
3 mm.

1 101.(previously presented) A method of manufacturing a cross-laminate comprising at least two
2 polymer films A and B which comprises:

3 separately forming each of said the at least two films A and B by coextruding:

4 a main layer of a polymer material selected to give high tensile strength,

5 a discontinuous first surface layer of a different polymer material forming an array

1 of thin strands extending in the direction of extrusion and
2 interposed between said the main layer and its first surface layer a continuous second
3 surface layer of a different polymer material
4 and imparting to each of said the polymer films a uniaxial or unbalanced biaxial molecular
5 orientation;
6 bringing said the films A and B together in sandwich relation with said the main directions
7 of orientation in crossing relation with the said the arrays on mutually facing sides of said the films
8 and the directions of the strands in said the arrays in crossing relation and
9 laminating said the films A and B together at least partly by heating to form a laminate;
10 selecting the polymer material of said the continuous second layers to control the lamination
11 strength in the strand-free regions thereof; and
12 selecting the polymer material of the strands of the each such array to control the lamination
13 strength at the crossing points of the strand arrays such that the lamination strength is highest at the
14 strand crossing points.

1 102.(currently amended) The A method according to claim 101 wherein:
2 at least one of said the films A or B is coextruded as a tubular film,
3 orientation is imparted to said the tubular film by drawing down the same while twisting to
4 give a helical direction of orientation thereto,
5 and comprising the further step of:
6 subsequently cutting open said the tubular film at an angle to the main direction of
7 orientation and to the direction of said the array of strands thereof.

1 103.(currently amended) The A method according to claim 101 wherein:
2 at least one of said the films A and B is coextruded in a circular coextrusion die in tubular
3 form with a circumference at the exit of said the die of at least 20 cm, and
4 the first surface layer thereof is coextruded discontinuously so that the distance from center-
5 to-center of adjacent strands in the tubular film at the exit from said the die is at the highest 4 cm.

1 104.(currently amended) The A method according to claim 101 which comprises the further step
2 of:

1 after said the films are brought together in said the sandwich arrangement and before, after
2 or simultaneously with their being laminated together, stretching said the films in their longitudinal
3 or transverse directions or both to further orient the same.

1 105.(previously presented) The method according to claim 101 wherein:

2 said the films A and B are brought together in said the sandwich relation with said the strand
3 arrays in direct contact to be directly sealed together upon lamination.

1 106.(previously presented) The method according to claim 101 wherein:

2 film A is coextruded as a five-layer assembly

3 having said the main layer

4 with at least one of said the first surface layers and

5 a second surface layer coextruded on both of the opposite sides of said the main
6 layer; and

7 said the five-layer film A is brought together with a said the film B on each of its opposite
8 sides

9 so arranged that the arrays of strands of the first surface layer of each said the film
10 B are in crossing relation with an array of strands of a first surface layer of said the film A proximate
11 thereto.

1 107.(currently amended) The A method according to claim 101 wherein:

2 at least one additional film C is brought together with at least one of said the films A and B
3 on a side opposite said the strand array of the latter,

4 said the film C comprising:

5 a main layer of a polymer material selected to give high tensile strength and

6 a continuous surface layer of a different polymer material on the side thereof facing

7 said the at least one of said the films A and B,

8 the polymer material of said the continuous surface layer being adapted when the

9 films are is laminated to produce a higher lamination strength of said the film C with

10 said the opposite side of said the at least one of films A and B than the lamination

11 strength between films A and B in the strand-free regions thereof.

1 108.(currently amended) The A method according to claim 101 wherein:

2 the separate coextrusions of said the films A and B are so controlled that the relative rates
3 of extrusion flow of the polymeric materials of said the main, second and first surface layers of said
4 the films A and B are such that said the first surface layer on each of the films A and B constitutes
5 at the highest 10% of the volume of the respective film A or B.

1 109.(currently amended) The A method according to claim 101 wherein:

2 the average melting point of the polymer material of said the strand-formed first surface layer
3 of each of said the films A and B is at least about 10°C lower than the average melting point of the
4 polymer material of the main layer thereof.

1 110.(previously presented) The method according to claim 101 wherein the polymer material of
2 the strand-formed array of at least one of said the films A and B comprises coloration material in
3 sufficient amount and/or coloration to render the strands visible through at least one side of the
4 cross-laminate.

1 111.(currently amended) The A method according to claim 101 wherein:

2 the polymer materials of said the main layer and said the second continuous layer of said the
3 film A are sufficiently transparent to render the strands of said the first surface layer thereof visible
4 therethrough, and

5 coextrusion conditions for the respective films are controlled so that the general thickness
6 of the final laminate is not more than about 0.3 mm, which further comprises:

7 embossing at least the exterior surface of said the film A into corrugations forming a pattern
8 of striations extending in one direction with corresponding thickness variations in said the film,

9 the separation between the striations in said the pattern being not more than about 3 mm and

10 the depth of the corrugations being sufficient to impart a three-dimensional effect to the
11 cross-laminate such that the strands when viewed from the A-side appear to be spaced internally
12 from the exterior surface of said the film a distance substantially greater than the actual maximum
13 thickness of said the film A.

1 112.(currently amended) The A method according to claim 111 wherein: said the embossing
2 is carried out by:

3 passing said the films A and B after they have been brought together in sandwich relation
4 and:

5 before or after said the films have been laminated through at least one pair of mutually
6 intermeshing grooved rollers to form said the corrugations while simultaneously effecting a
7 transverse stretching of the same.

1 113.(currently amended) The A method according to claim 101 wherein:

2 the separate coextrusions of said the films A and B are so controlled that the relative rates
3 of extrusion flow of the polymeric materials of said the main, second and first surface layers of said
4 the films A and B are such that said the first surface layer on each of the films A and B constitutes
5 at the highest 5% of the volume of the respective film A or B.

1 114.(currently amended) The A method according to claim 101 wherein:

2 the average melting point of the polymer material of said the stand-formed first layer of each
3 of said the films A and B is at least about 20°C lower than the average melting point of the polymer
4 material of the main layer thereof.

1 115.(currently amended) The A method according to claim 102 wherein:

2 said the first surface layer of said the tubular film is coextruded discontinuously so that the
3 distance from center-to-center of adjacent strands thereof is at most 20 mm.

1 116.(currently amended) The A method according to claim 101 wherein: said the laminating
2 comprises:

3 extruding between said the films A and B an intermediate layer of a molten polymer material
4 selected to effect lamination of the films as they are brought together in sandwich relation and
5 cooled.

1 117.(currently amended) The A method according to claim 101 which further comprises

2 coextruding at least one of said the films A and B with a said the discontinuous surface layer

1 on both of its sides,

2 separately coextruding a film C having a said the main layer with a said the first
3 discontinuous surface layer and a said the second continuous surface layer on at least one of its sides
4 and

5 laminating said the film C to an exterior side of at least one of said the films A and B with
6 the first surface layer of film C facing said the exterior side before, during or after films A and B are
7 brought together in said the sandwich relation to laminate the said the films A, B and C together,
8 the polymer material of the surface layer of said the film C being selected in association with
9 the lamination conditions to produce a stronger lamination at the crossing points of the strands of
10 its first surface layer and the strands of the adjacent first surface layer of said the film A or B than
11 in the strand-free regions thereof.

1 118.(new) A cross-laminate comprising:

2 a first coextruded film A having a main direction of molecular orientation and including:

3 a continuous main layer comprising a polymer material having a high tensile strength,
4 a patterned discontinuous layer disposed on a surface of the main layer, where the
5 discontinuous layer comprises a different polymer material,

6 a second coextruded film B having a main direction of molecular orientation and including:

7 a continuous main layer comprising a polymer material having a high tensile strength,
8 a patterned discontinuous surface layer disposed on a surface of the main layer,
9 where the discontinuous layer comprises a different polymer material,

10 where the film B is arranged so that the main direction of the film B crosses the main
11 direction of the film A and the pattern of the discontinuous layer of the film B crosses
12 the pattern of the discontinuous layer of the film A, and

13 strong bonds bonding the films together at intersections of the pattern of the discontinuous
14 layer of the film A and the pattern of the discontinuous layer of the film B,

15 where the films A and B are either uniaxially or unbalanced biaxially molecularly oriented.

1 119.(new) The cross-laminate according to claim 118, further comprising:

2 a continuous bonding layer interposed between the main layer and the discontinuous layer
3 of each of the films A and B and

1 weak bonds formed between the bonding layers of the films A and B in regions of the films
2 free of the discontinuous layers.

1 121.(new) The cross-laminate according to claim 118, further comprising:
2 moderate bonds formed between the bonding layer of one the films A or B and the
3 discontinuous layer of the other film B or A.

1 122.(new) A cross-laminate according to claim 118, wherein:
2 the film A further including a patterned second discontinuous layer disposed on a second
3 surface of the main layer, where the second discontinuous layer comprises a different polymer
4 material, and
5 the cross-laminate further comprising:
6 a second B film arranged so the main direction of the second B film crosses the main
7 direction of the film A and the pattern of the discontinuous layer of the second B film
8 crosses the pattern of the second discontinuous layer of the film A,
9 second strong bonds bonding the second B film to the film A together at intersections of the
10 pattern of the second discontinuous layer of the film A and the pattern of the discontinuous layer of
11 the second B film ,
12 where the second B film is either uniaxially or unbalanced biaxially molecularly oriented.

1 123.(new) The cross-laminate according to claim 120, further comprising:
2 a continuous bonding layer interposed between the main layer and the discontinuous layer
3 of each of the film A, the B film and the second B film and
4 weak bonds formed between the bonding layers of the films A and B and the films A and the
5 second B film in regions of the films free of the discontinuous layers.